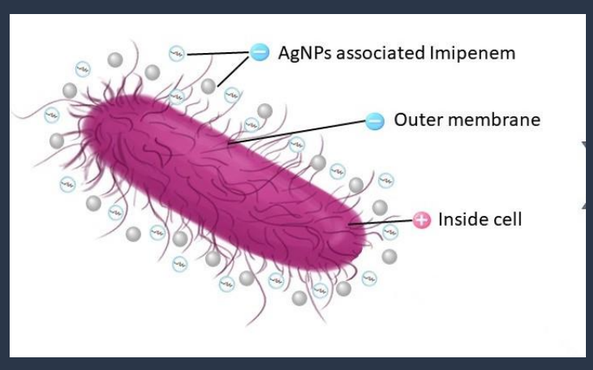
Electrokinetic Analysis of Silver Nanoparticles and Carbapenem Antibiotic Combinations in *Klebsiella pneumoniae* Strains

Inglid Fontoura[1] and Maiara Lima Castilho[2]

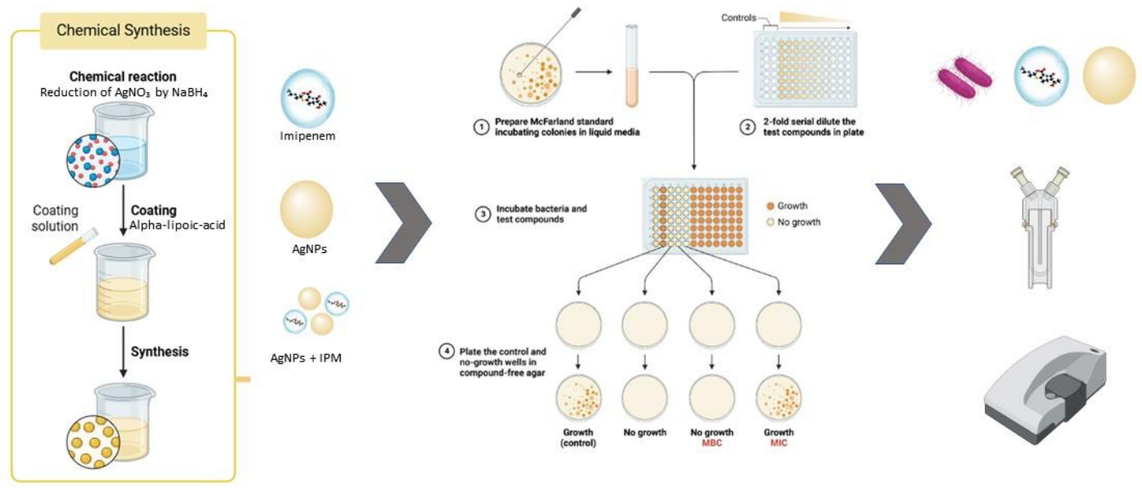
Bionanotechnology Laboratory,University of Paraiba Valley, São José dos Campos, SP, Brazil
inglidfontoura@hotmail.com and mcastilho@univap.br

INTRODUCTION

Antibiotics have revolutionized medical practice by enabling advances across virtually all fields of clinical medicine. However, antimicrobial resistance now threatens to compromise and even reverse some of these achievements. Given this scenario, nanotechnology has emerged as a promising alternative. In particular, silver nanoparticles have demonstrated potent antimicrobial activity, including synergistic effects when combined with antibiotics. Nevertheless, limitations remain regarding a detailed understanding of their mechanism of action, which may be elucidated through the analysis of electrokinetic properties.



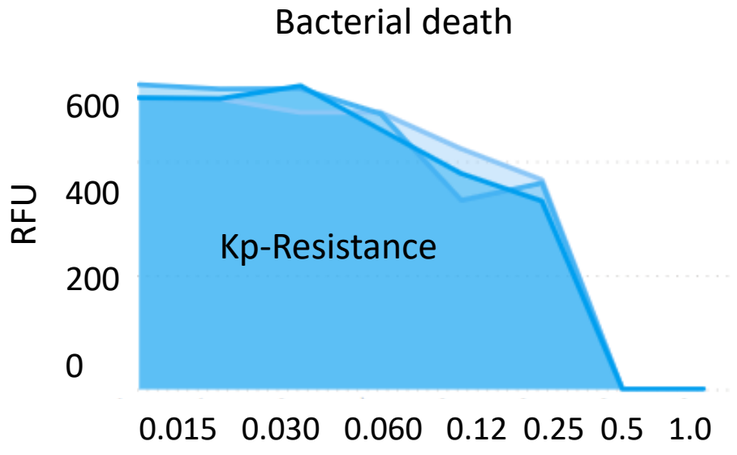
METHODOLOGY

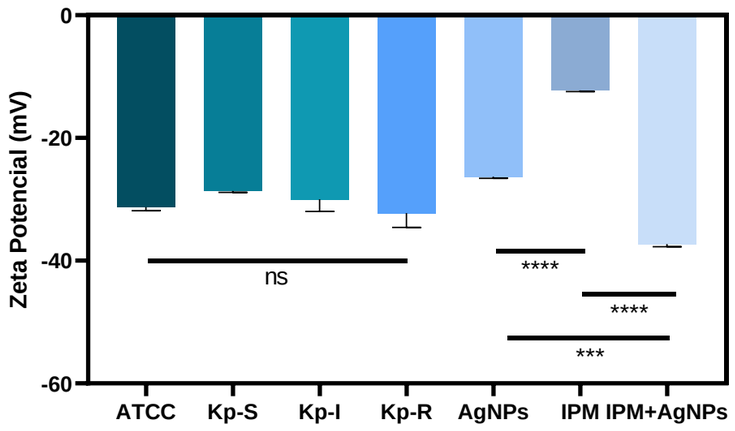


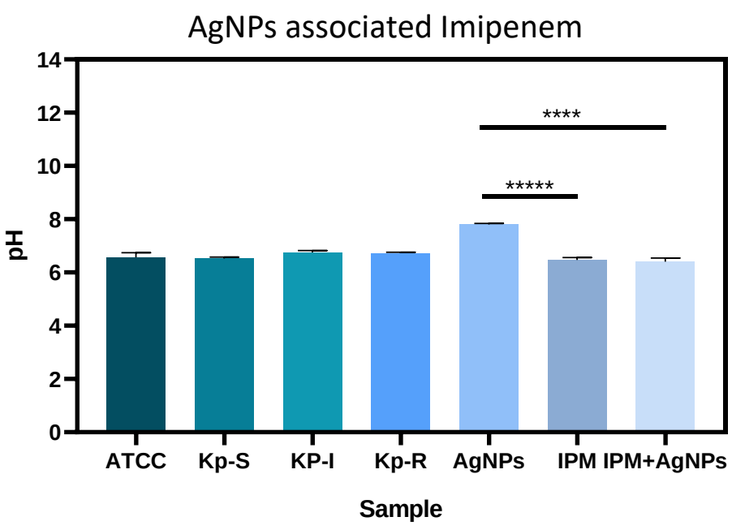
RESULTS

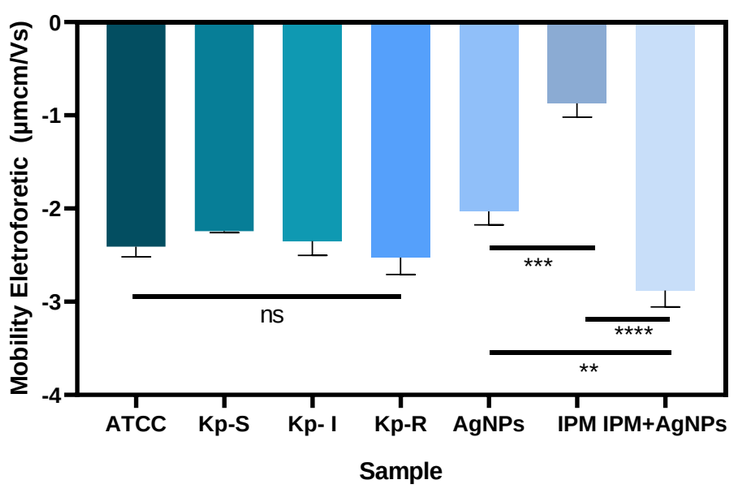
Strain	Source of isolation	MIC AgNPs + IPM	Fold change of IPM	FICI
ATCC 700603	Urine	0.015	32	0.5
Kp-Susceptible	Catheter	0.015	32	0.5
Kp-Intermediate	Catheter	0.015	256	0.5
Kp-Resistance	Urine	0.500	16	0.5

AgNPs: $2x10^{11}$ part./mL and IPM: µg/mL.









Conclusion:

The results indicated a synergistic antimicrobial interaction between silver nanoparticles and imipenem. Electrokinetic analysis, based on surface charge, suggests that repulsion occurs between the charges of the bacterial cell wall and antimicrobials, while attraction of antimicrobial charges toward the cell interior may occur through porin channels—indicating a possible mechanism of action of the nanodrug. Thus, electrokinetic analysis of silver nanoparticles and imipenem may provide valuable insights into the mechanisms underlying antimicrobial activity against multidrug-resistant bacteria.

Acknowledgements: FAPESP 2018/23898-6, CNPq 427602/2018-10 and CAPES 88887.185627/2018-00.